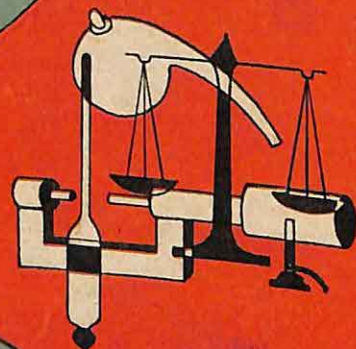


# Help Yourself to Science

by  
N. A. WATTS



BOOK  
FOUR



ORIENT

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# HELP YOURSELF TO SCIENCE

## BOOK FOUR

### A WORKBOOK TO ACCOMPANY

~~1/6~~

### Adventures in Tropical Science, Book IV

By

N. A. WATTS, B.Sc., B.T., A.B.T.I.



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## PREFACE

THE analysis, identification, measurement and evaluation of the abilities of pupils that underlie and condition achievement in Science constitute the peak-point of the use of self-tests in modern, enlightened teaching practice. The self-tests in **HELP YOURSELF TO SCIENCE** are an important device in the teacher's diagnostic equipment, for they have been specially designed to test the mental ability of the pupil, not only from the viewpoint of content mastery, but have also taken into account other learning products which include such aspects as thinking skills and desirable attitudes.

Teachers will find that these informal objective tests inject a surprisingly large degree of accuracy into their methods of diagnosis, measurement and evaluation. Through the use of these adequately valid and reliable measuring devices, teachers will obtain precise, instructional information concerning the abilities and limitations of their pupils, of individual pupil differences in capacity and achievement and the status of achievement of the class as a whole.

The Workbooks will keep the pupil informed of his progress and this will inevitably serve as further incentive to greater effort. The tests will aid the pupil to check and marshal his grasp of the text and give him practice in the skills of collecting data, solving problems, applying his understanding to everyday situations and in this way, further reinforce his command of the subject.

These tests, chiefly because of their definiteness and objectivity, will also reveal to the teacher the extent of efficiency of certain special methods of instruction he has employed, while special types of emphasis he has used will be brought into sharp focus from a critical analysis and interpretation of the test results. The results will also give the teacher evidence of pupils' progress towards specific goals of achievement: their ability to express their knowledge, the extent of their understanding of the science vocabulary used in the text, their mastery of facts, their growth in scientific attitudes, interests and appreciations and their proficiency in using their freshly acquired skills to identify, attack and solve problems. Furthermore, the results will provide the teacher with a basis for the objective grade placement of pupils.

**HELP YOURSELF TO SCIENCE** is purposely designed so ensure maximum activity on the part of the pupil. The learning experiences in the series have been styled and organised to involve the pupil in the process of learning about science, for it is such involvement in a meaningful learning experiment which is directed towards the accepted objectives of science teaching, that will further vitalise his study of the texts and serve to develop, clarify and enrich his science understandings. These thought-provoking, study-helps are planned to raise the pupil out of the mire of conventional memorisation of factual material and the traditional tendency to cast all instruction into the mould of mere assimilation of subject matter; they aim at providing guidance to first-hand experiences which offer the pupil abundant opportunities to effectively translate into action his newly acquired knowledge in the world outside the classroom. Accordingly, specific directions are given for independent and group investigation and experimentation which focus on the major concepts and principles presented in the texts, so that the pupil may experience the thrill of active participation as he explores his environment to collect the evidence he requires to facilitate his learning of the subject.

Properly exploited by the teacher the suggested experiences in each Workbook may well open new avenues of interest and satisfaction to the pupil besides amplifying and extending the corresponding text which it accompanies, thereby contributing to overall understanding and fulfilling the triple function for which it has been designed—to serve as a testing, a learning and a teaching aid.

Each Workbook contains tests which are constructed parallel to the chapters in the text-book it accompanies, so that the student's mastery of each chapter is facilitated. At the end of the book are tests which require the integration of the knowledge gained in the preceding chapters in order to be answered correctly.

The sheets in the Workbook may be distributed separately in schools where a loose-leaf file is in use for the subject, or the Workbook can be used intact. In either case, the corrected exercises should be readily available as a reference for study and review.

## ADVENTURES IN TROPICAL SCIENCE

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to the study of General Science  
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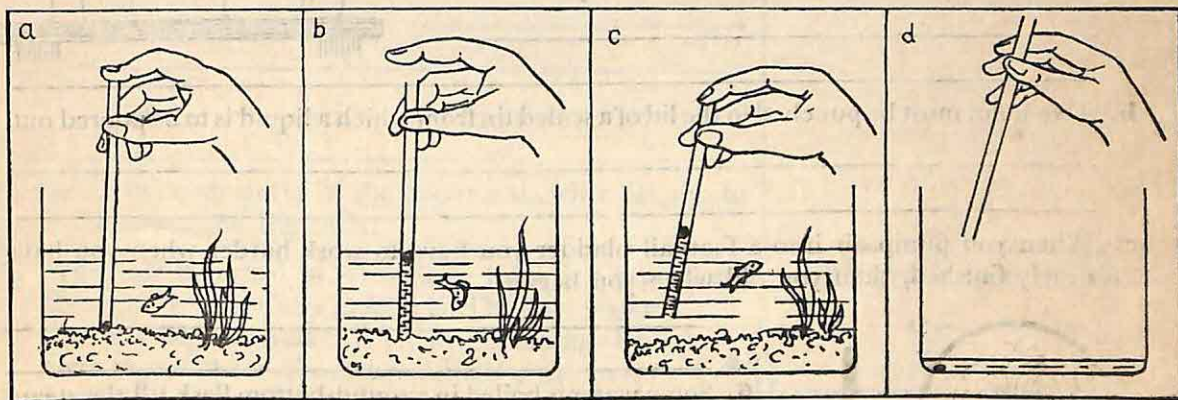
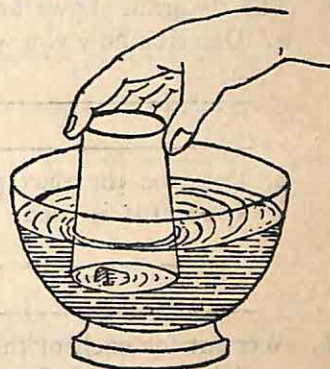
1

## Tricks with Air Pressure

1. A cork is floated on the surface of water contained in a glass bowl. A tumbler is inverted, mouth downwards, over the cork and thrust into the water.

Mark an **X** before any one of the following statements to indicate what you think is proved by this experiment.

- \_\_\_\_\_ a. Air presses in all directions.  
\_\_\_\_\_ b. We live in an ocean of air.  
\_\_\_\_\_ c. Air has weight.  
\_\_\_\_\_ d. Air takes up space.  
\_\_\_\_\_ e. Air is essential for life.
2. This series of diagrams shows the steps by which waste matter can be removed from an aquarium. How does air pressure affect each step?



- a. \_\_\_\_\_  
b. \_\_\_\_\_  
c. \_\_\_\_\_  
d. \_\_\_\_\_

3. Explain what happens when :

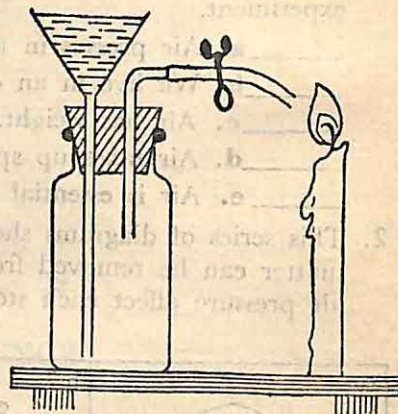
- a. You press your thumb over the end of the outlet tube of a bicycle pump, push the piston in, and then immediately release it.

b. The lid of an air-tight tin is punctured.

c. A wad of paper is set alight and dropped into a glass bottle, and a sheet of balloon rubber is immediately stretched over the mouth of the bottle.

4. The diagram shows an apparatus that can be used to extinguish the flame of a candle.  
a. Describe how you would use the apparatus for this purpose.

b. Describe the part played by air pressure when the apparatus is used.

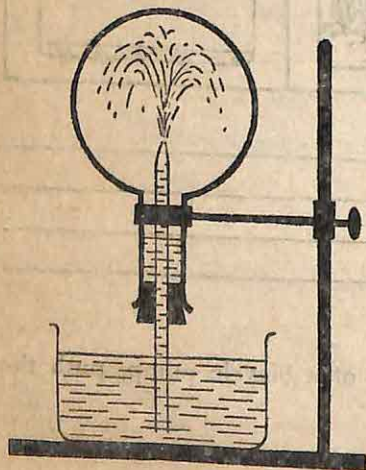


5. Account for each of the following facts.

a. A bubble of air formed at the bottom of a pond bursts as soon as it reaches the surface of the pond.

b. Two holes must be punched in the lid of a sealed tin from which a liquid is to be poured out.

c. When you pump air into a football bladder you have to work harder when you have nearly finished, than you did when you began.



6. Some water is boiled in a round-bottom flask till the steam comes out freely. The source of heat is removed and a glass jet is inserted in the mouth of the flask. The flask is inverted and supported as shown—with the tube dipping into a beaker of water. After a little while a fountain issues from the jet. Explain how the fountain is caused.

## The Secret of the Air

1. State three reasons which prove that a boy is like a burning candle.

i. \_\_\_\_\_

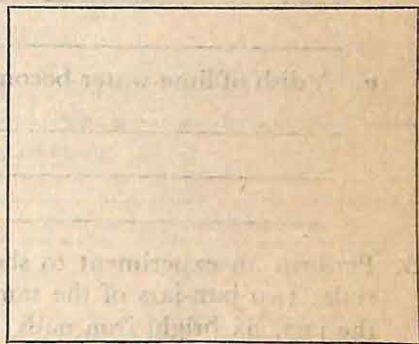
ii. \_\_\_\_\_

iii. \_\_\_\_\_

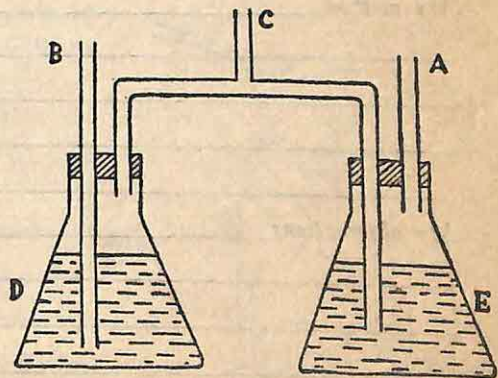
2. a. Describe how you would separate nitrogen from the air if you were given a candle, a tumbler and a match-box.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b. Draw a diagram of the apparatus, when set up, in the space on the right.



3. When air is sucked in through *C*, tube *A* is kept closed with the finger, and air bubbles through the lime-water in flask *D*. The lime-water does not become milky. After this operation has been repeated for about ten minutes, the lime-water becomes slightly milky. When air is breathed out through *C*, tube *B* is kept closed with the finger, and air bubbles through the lime-water in flask *E*. In this case the lime-water becomes milky immediately. Explain.



4. Account for each of the following facts.

a. A garden fork rusts.

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b. The flame of a burning match is extinguished if stamped with your shoe.

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c. The wood in a kitchen fire is arranged loosely.

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d. A crowd is never allowed to collect around a person who has been suffocated.

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e. A dish of lime-water becomes milky on exposure to air.

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5. Perform an experiment to show how rusting can be prevented. Use the following materials: two jam-jars of the same size containing some water, two wooden boards to cover the jars, six bright iron nails, and some grease.

My method

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My observations

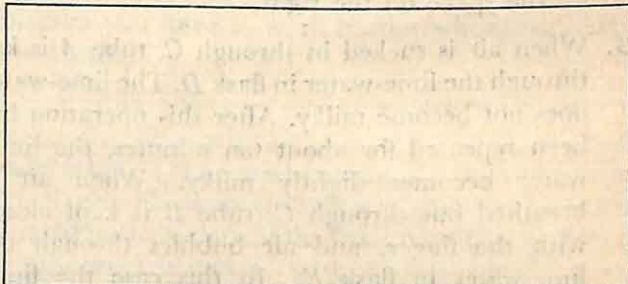
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My conclusions

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A drawing of my apparatus

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## More about Invisible Gases

### 1. State :

a. Four uses of oxygen.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_
- iii. \_\_\_\_\_
- iv. \_\_\_\_\_

b. Three uses of carbon dioxide.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_
- iii. \_\_\_\_\_

c. Two ways in which carbon dioxide is similar to oxygen.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_

d. Two ways in which carbon dioxide is different from oxygen.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_

e. One way in which acetylene is different from oxygen.

2. Fix three candles *a*, *b* and *c* to a wooden board, and arrange the board in a wide-mouthed glass jar as shown. Take some vinegar in a small tumbler and place it in the jar. Set the candles alight, and add a spoonful of baking soda to the vinegar. Perform the experiment and write about it.

My observations \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

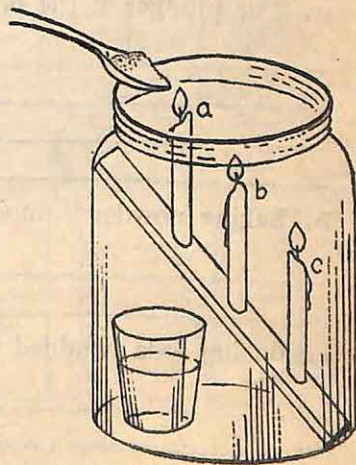
\_\_\_\_\_

My conclusions \_\_\_\_\_

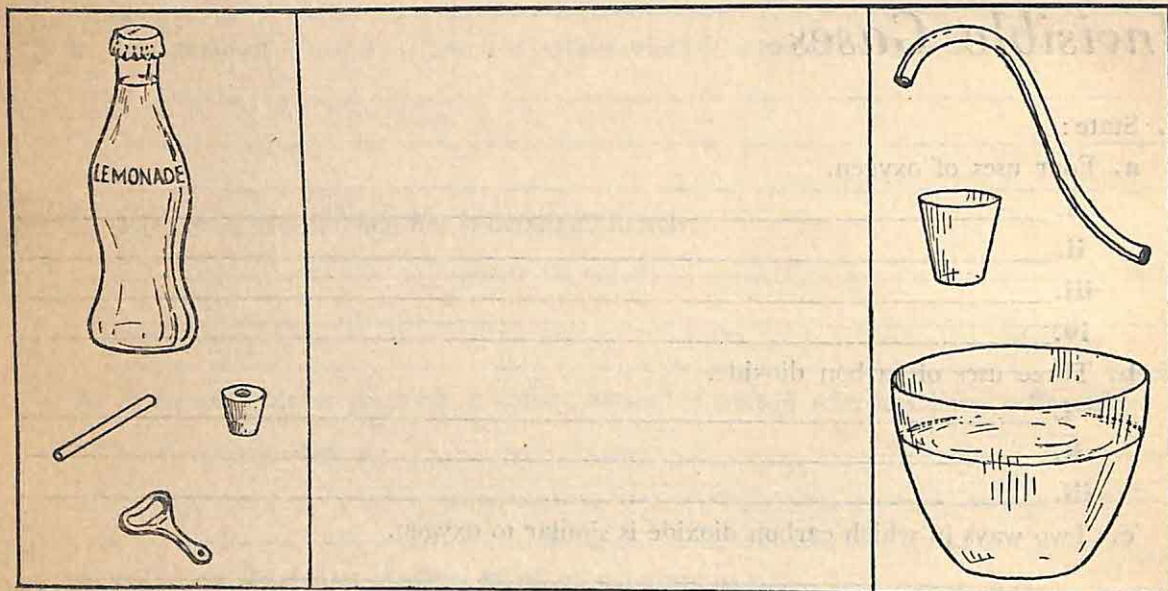
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



3. a. How will you collect a tumbler of carbon dioxide if you are given the apparatus as shown ? Draw a diagram in the central space, of the apparatus as you would fit it up for use.



b. How would you test for the gas ?

---

4. Name five different kinds of substances which give off carbon dioxide when burnt.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_ iv. \_\_\_\_\_ v. \_\_\_\_\_

5. Describe what happens, and name all the products formed when :

a. The plunger at the bottom of a fire extinguisher is struck against the ground.

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b. Baking powder is moistened.

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c. Baking soda is added to half a bottle of hydrogen peroxide.

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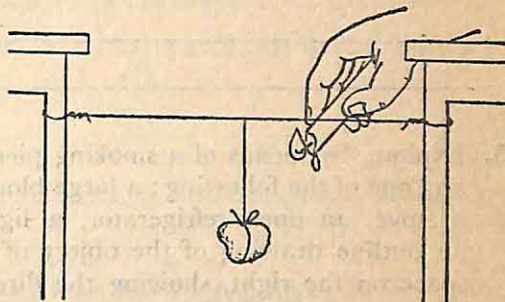
## What Heat Can Do

1. Take a piece of wire, about a metre in length, and tie it to the legs of two tables as shown. Tie one end of a string to a stone, and tie the other end to the middle of the wire. Heat the wire with a candle flame. Perform the experiment and write about it.

My observations \_\_\_\_\_

\_\_\_\_\_

My conclusions \_\_\_\_\_



2. Some boy scouts were standing around a large camp fire. One claimed that a north wind was blowing, another claimed that a south wind was blowing, yet another claimed that an east wind was blowing, and still another claimed that a west wind was blowing. Their Scoutmaster, who was standing some distance away, said that there was no wind at all. Everyone was correct. Can you explain how this could be so?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Obtain a number of thin rods, of the same thickness and length, of the following solids: aluminium, brass, copper, glass, iron and zinc. Arrange them fan-wise on a block of wood. Fix small nails, or drawing pins, by means of candle wax to the ends of the rods. Heat the opposite ends with the flame of a candle. Perform the experiment and write about it.

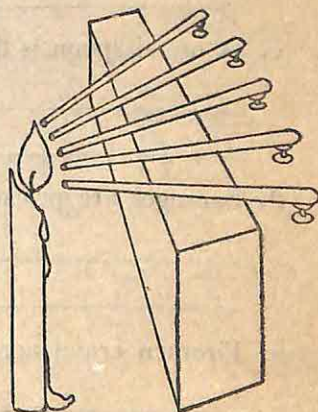
My observations \_\_\_\_\_

\_\_\_\_\_

My conclusions \_\_\_\_\_

\_\_\_\_\_

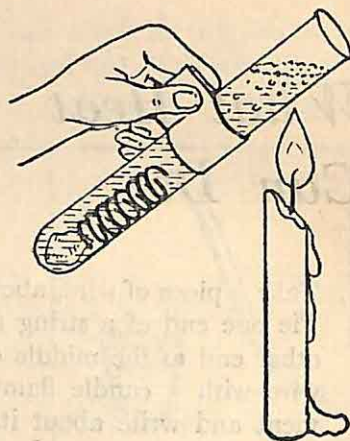
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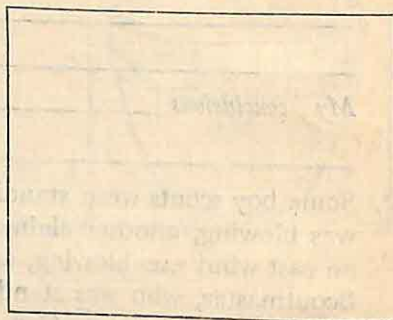
4. Slide a small piece of ice into a testtube, and then slide a metal spring into the testtube, to keep the ice in position. Pour some water in the testtube and heat the water near the top of the testtube with the flame of a candle. Perform the experiment and write about it.

My observations \_\_\_\_\_

My conclusions \_\_\_\_\_



5. Explore, by means of a smoking piece of paper, the paths of convection currents around any one of the following : a large block of ice, a radiator, a stove, an open refrigerator, a lighted candle. Make an outline drawing of the object of your choice in the space on the right, showing the direction in which the convection currents move, by means of arrows.



6. Account for each of the following facts.

a. The cork of a thermos-flask, which is filled with boiling water, is sometimes blown out of the flask after a short time.

\_\_\_\_\_

\_\_\_\_\_

b. A balloon filled with air becomes smaller when it is placed in a refrigerator.

\_\_\_\_\_

\_\_\_\_\_

c. A metal spoon is first placed in a glass tumbler which is to be filled with hot water.

\_\_\_\_\_

\_\_\_\_\_

d. Sausages are pricked with a fork while cooking.

\_\_\_\_\_

\_\_\_\_\_

e. Firemen crawl across the floor of a room which is filled with smoke.

\_\_\_\_\_

\_\_\_\_\_

- f. Some tall skyscrapers lean towards the north at midday, and towards the east in the afternoon.

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- g. We use a woollen blanket to keep ourselves warm in winter, and we can also use the same blanket to preserve ice.

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- h. The sparks of a bonfire go upwards.

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- i. Although water is a bad conductor of heat it becomes heated rapidly.

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- j. Birds puff up their feathers on a cold day.

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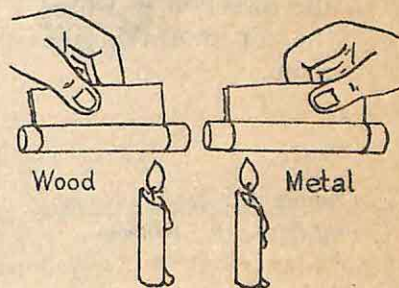
7. Wrap a sheet of paper around a cylinder of wood, and another sheet of paper around a cylinder of metal having the same thickness as that of wood. Hold both cylinders over candle flames.

- a. Which sheet of paper chars first ? \_\_\_\_\_  
b. Give an explanation for the difference you note.

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8. State :

- a. Two examples when we use good conductors of heat to our advantage.

i. \_\_\_\_\_

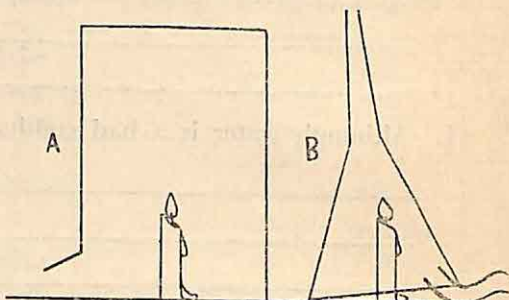
ii. \_\_\_\_\_

- b. Two examples when we use bad conductors of heat to our advantage.
- \_\_\_\_\_
  - \_\_\_\_\_
- c. Three examples of the production of heat by friction.
- \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
- d. One example when we use the fact that liquids expand when heated to our advantage.
- \_\_\_\_\_
- e. The best way to get a dent out of a ping-pong ball.
- \_\_\_\_\_

9. Take two lighted candles and fix each to a table. Cover the first with a large jar *A*, whose lip does not come in contact with the table, and cover the second with a large funnel *B*, which is raised off the surface of the table by means of a rubber tube. Perform the experiment and write about it.

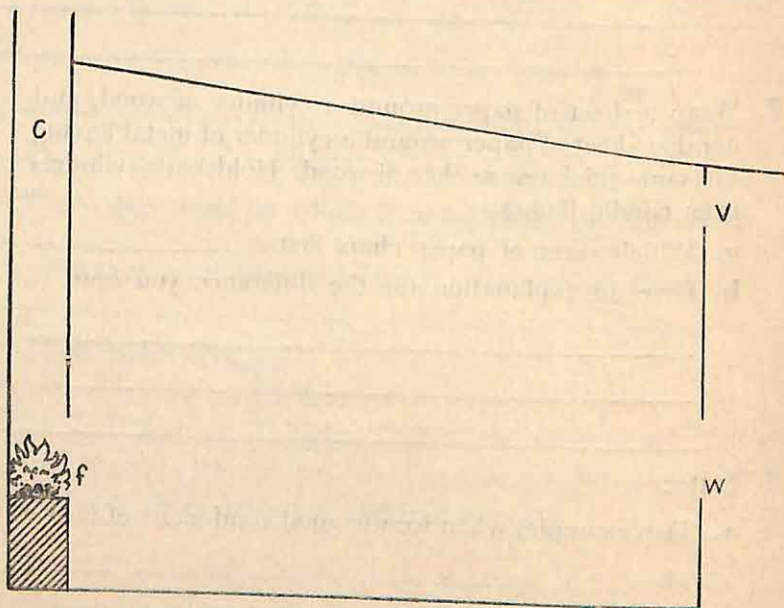
My observations \_\_\_\_\_

My conclusions \_\_\_\_\_



10. Indicate, by marking arrows on the diagram, the direction in which the air moves in the room.

*c*, chimney ; *f*, fire ;  
*v*, ventilator ; *w*, window.



## Light in Our Lives

1. State three uses we make of :

a. Shadows.

i. \_\_\_\_\_

ii. \_\_\_\_\_

iii. \_\_\_\_\_

b. Mirrors.

i. \_\_\_\_\_

ii. \_\_\_\_\_

iii. \_\_\_\_\_

c. Translucent materials.

i. \_\_\_\_\_

ii. \_\_\_\_\_

iii. \_\_\_\_\_

2. Draw rays of light to show how the girl in the diagram is able to see the back of her head with the help of two mirrors.

3. Account for each of the following facts :

a. The pupil contracts when bright light is suddenly shone on the face.



b. Mountaineers must protect their eyes with coloured glass.

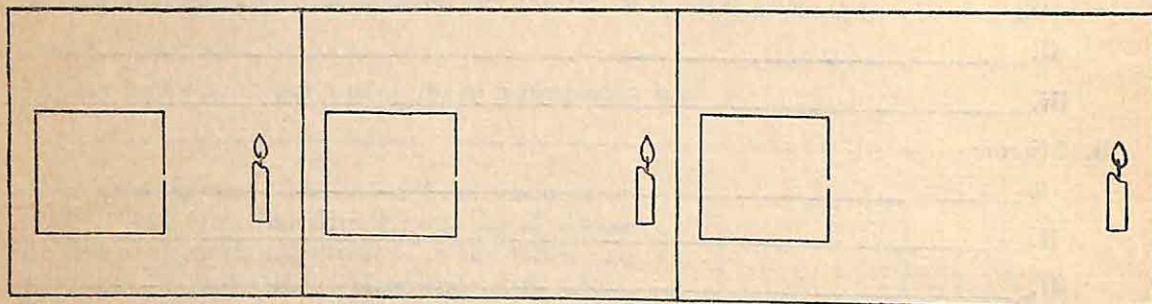


c. Lantern slides are placed upside down in a magic lantern.

d. The source of light should always be above, and behind you, when you read at night.

e. A person X in a lighted room cannot see another person Y in a dark room, but Y can see X.

4. a. Complete each diagram by drawing rays of light to show how a picture of a candle is formed on the tissue paper at the back of a pin-hole camera.



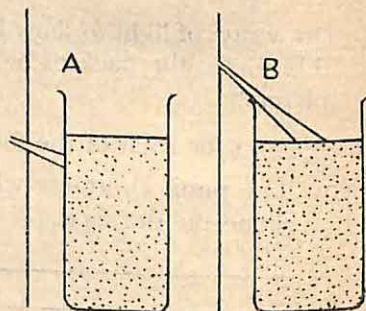
b. What are your conclusions after you have completed all three drawings ?

5. Take two tumblers *A* and *B* and pour some water into each. Make the water of each tumbler cloudy with a few drops of milk. Take two rectangular strips of cardboard, punch a hole in the first so that direct sunlight will strike the water in this tumbler below the surface, as shown. Punch a hole in the second, so that direct sunlight will strike the water in the second tumbler above the surface as shown.

a. Perform the experiment and write about it.

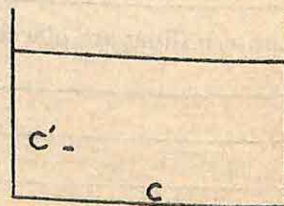
My observations \_\_\_\_\_

My conclusions \_\_\_\_\_



b. Complete each diagram by showing what happens to the path of each beam of light.

6. In the diagram on the right, *C* represents a small coin placed at the bottom of a pan. When the eye is in position as shown, the coin is invisible. When water is poured into the pan, however, the coin apparently rises to *C'*, and becomes visible, even though the position of the eye remains the same. Draw ray tracks from the coin to the eye to show how this happens.



6

## Sound Fun

1. State :

- a. One way in which sound resembles light.  
\_\_\_\_\_
- b. Two ways by which a vibrating wire can be altered in order to produce a higher note.
  - i. \_\_\_\_\_
  - ii. \_\_\_\_\_
- c. One property of sound which is not possessed by light.  
\_\_\_\_\_
- d. The change that must be made to an organ pipe for it to give a higher note.  
\_\_\_\_\_
- e. The property of sound illustrated by the production of an echo.  
\_\_\_\_\_

2. If a statement is true, write the word 'True' in the blank space below the statement ; if false, write the word which should be substituted for the italicised word to make the statement true.

- a. Sounds are produced by materials in a state of *motion*.  
\_\_\_\_\_
- b. Liquids conduct sounds *more* readily than gases.  
\_\_\_\_\_
- c. To avoid unwanted echoes in a large hall, the walls and ceilings must be covered with a material that reflects *air* vibrations.  
\_\_\_\_\_
- d. A violinist tunes his violin by adjusting the *length* of its strings.  
\_\_\_\_\_
- e. The strings of a guitar producing high notes are *thicker* than those producing low notes.  
\_\_\_\_\_

3. Account for each of the following facts :

- a. When the prongs of a fork are struck against a hard object, a distinct note can be heard.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- b. If, when the prongs are vibrating, the handle is made to touch the top of a table, there is an increase in the volume of sound produced.

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- c. There is a difference in effect when a sound is produced first in a room with many pieces of furniture in it, and then in the same room with all the furniture removed.

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- d. When a boy whistles, he changes the cavity inside his mouth to produce the different notes of the scale.

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- e. Although all four strings of a violin are of the same length, the sound emitted by each of them is different.

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- f. Sometimes a dog is seen to prick up its ears.

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- g. A time-keeper at a sports meeting clicks his watch when he sees the smoke given off from the starter's pistol instead of when he hears the report of the pistol.

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- h. A carpet placed on the stairs helps to keep a house quiet.

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- i. Sometimes a loud sound such as a thunderclap rattles the windows of a house.

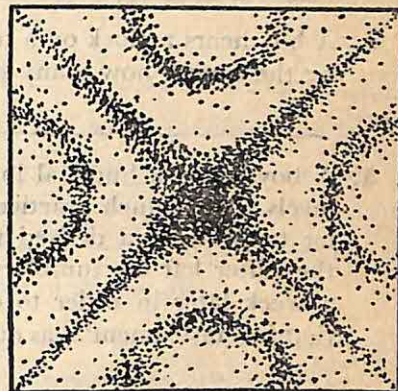
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- j. We hear the buzz of a mosquito, but we do not hear any sound when a large bird, such as a kite, flies past us.

4. A glass plate is fixed horizontally by a screw passing through its centre. Sand is sprinkled evenly over the plate and the edge of the plate is bowed with a violin bow that is moved in a vertical direction. It is seen that the sand collects in lines and curves to form various patterns, one of which is shown in the diagram. Complete the following passage by writing one or more words in the blank spaces.



When the plate is bowed it begins to \_\_\_\_\_. Most of the sand rolls away in places where the plate is \_\_\_\_\_ while the sand collects in those places where the plate is \_\_\_\_\_. The patterns formed by the sand thus show us \_\_\_\_\_.

5. Complete the following table.

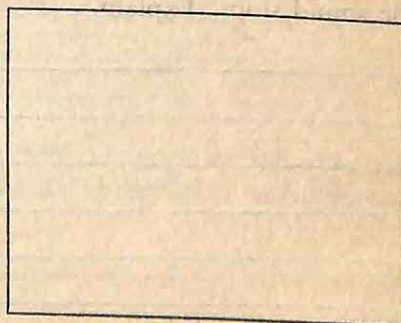
| <i>Musical instrument</i> | <i>Vibrating source</i> |
|---------------------------|-------------------------|
| Piano                     |                         |
| Gramophone                |                         |
| Trumpet                   |                         |
| Drum                      |                         |
| Clarinet                  |                         |

6. How would you prove that the note emitted by a vibrating column of air depends on its length ?

Materials required \_\_\_\_\_

My method \_\_\_\_\_

My observations \_\_\_\_\_



*The apparatus*

7. Solve these problems.

a. If you were watching a cricket match at a distance of half a mile from the batsman, how long will it be before you heard the sound of the batsman striking the ball ?

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b. During a thunderstorm a boy notes that he hears the thunder eight seconds after seeing a distant flash of lightning. How far away is the boy from the source of disturbance ?

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c. A boy hears a clock on a tower strike when he is three miles away. If he sets his watch by the sound, how many seconds wrong would he be ?

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d. A boy made a 'musical instrument' by filling several tumblers with water to different levels. After much practice, and by carefully adjusting the level of water in each tumbler to produce a desired note, he finally succeeded in playing a simple melody. He thereafter left the tumblers with their contents on a shelf. When he returned to them a week later in order to demonstrate his 'musical instrument' to a friend, he found that his 'instrument' was out of tune. Explain.

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e. A speaker is heard more readily in the room of a house than in the open air. Explain.

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8. Depress the loud pedal of a piano with your foot. Look inside to see what happens. Close the piano, and with your foot still on the pedal, sing a single note for a few seconds. Listen to the piano. If you remove your foot from the pedal the sound stops. Explain.

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7

# The Soil and Us

## 1. State:

- a. Five practices you would recommend to the farmer to save his soil from the wasteful effects of running water.

i. \_\_\_\_\_  
ii. \_\_\_\_\_  
iii. \_\_\_\_\_  
iv. \_\_\_\_\_  
v. \_\_\_\_\_

- b. One undesirable effect which results from over-grazing of grasslands.

\_\_\_\_\_  
\_\_\_\_\_

- c. Five differences between topsoil and subsoil.

i. \_\_\_\_\_  
ii. \_\_\_\_\_  
iii. \_\_\_\_\_  
iv. \_\_\_\_\_  
v. \_\_\_\_\_

- d. Three differences between sand and clay.

i. \_\_\_\_\_  
ii. \_\_\_\_\_  
iii. \_\_\_\_\_

- e. Three ways in which a good garden soil is better than a clay soil.

i. \_\_\_\_\_  
ii. \_\_\_\_\_  
iii. \_\_\_\_\_

2. Although uncultivated ground supports plentiful vegetation year after year, yet manure and artificial fertilisers have to be added to cultivated soil in order to maintain a satisfactory yield of crops. Explain.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. If a statement is true, write the word 'True' on the blank space below the statement; if false, write the word(s) which should be substituted for the italicised word(s) to make the statement true.

a. The uppermost layer of soil, called topsoil, is *older* than the subsoil beneath it.

b. The topsoil absorbs and retains most of the water supplied by rainfall when *the natural vegetation covering it has been removed*.

c. Humus consists of *a mixture of sand and clay*.

4. Make a sprinkling tin by punching a number of holes in the bottom of a cigarette tin. Fill a flower pot with loose soil and then press a few bottle caps on to the surface of the soil. Sprinkle water over the soil in the flower pot.

a. Perform the experiment and write about it.

My observations \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

My conclusions \_\_\_\_\_

\_\_\_\_\_

b. Illustrate your experiment in the given space.

5. The bar graph shows the composition of soils from :

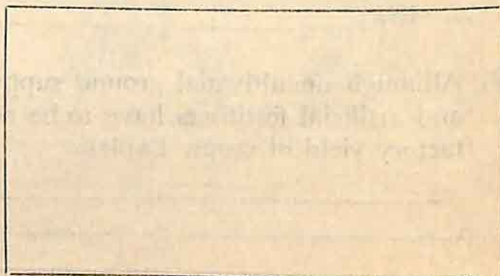
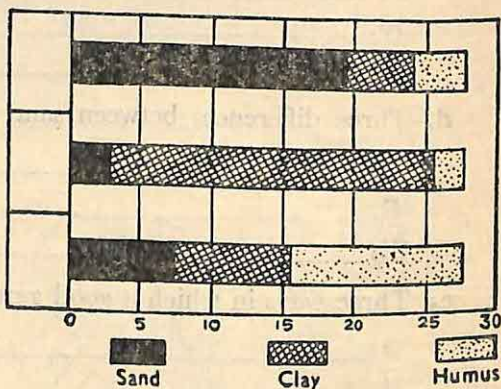
- a. The mud bank of a pond.  
b. The side of a river.  
c. Under a tree.

Match each type of soil with its graphical representation by writing its letter in the proper space allotted to it on the graph.

6. Make a map of the school playing field in the given space. Colour the sandy areas on it yellow, the clay areas black, and the grassy areas green.

7. How does fire damage the soil ?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



8

## Factories of a Plant

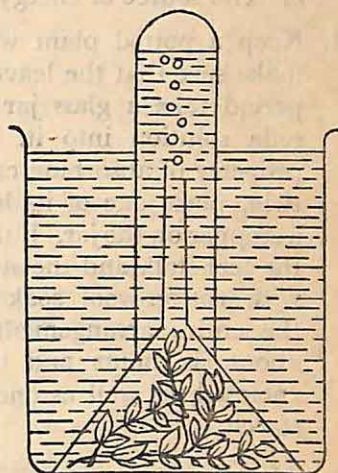
1. a. What is the purpose of the apparatus ?

b. What test would you apply to show the nature of the gas which collects in the testtube ?

c. What would happen if the apparatus was transferred to a dark cupboard?

d. What kind of plant would you use for the experiment?

e. What information does the experiment give you about the value of green plants in an aquarium ?



2. At 6 P.M. on a summer evening, the midrib of the guava leaf as shown in the diagram was severed at X. At 3 A.M. on the following morning, the entire leaf was removed from the plant, decolourised, and thereafter placed in iodine solution.

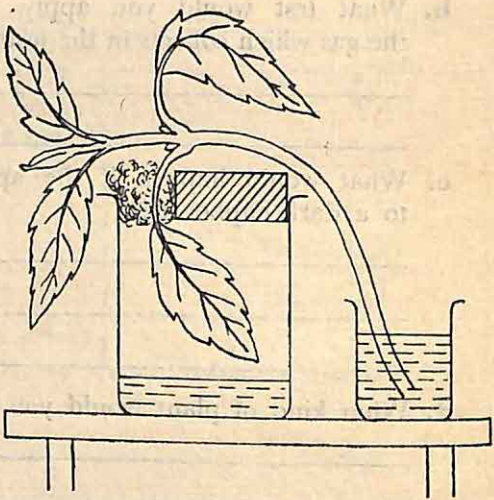
a. Shade that portion of the leaf which became blue-black in the iodine solution.

b. Explain why only part of the leaf became blue-black.

3. Name :

- a. The part of a green plant in which food is made. \_\_\_\_\_
- b. The material in the plant necessary for food-manufacture. \_\_\_\_\_
- c. The part of the plant through which carbon dioxide enters. \_\_\_\_\_
- d. The part of the plant through which water enters. \_\_\_\_\_
- e. The source of energy necessary for food-manufacture. \_\_\_\_\_

4. Keep a potted plant which has long leaf-stalks in a dark cupboard overnight so as to make sure that the leaves are free of starch at the beginning of the experiment. After this period take a glass jar and pour some caustic soda solution into it. This substance has the property of absorbing carbon dioxide. Cut off a twig, place one of its leaves in the jar, and fix a stopper on the jar. If there is any space between the leaf-stalk and the stopper, it should be filled with cotton-wool soaked in lime-water. Stand the entire arrangement in bright sunlight for about six hours and test the leaf which was enclosed, as well as one of the other leaves, for starch.



My observations \_\_\_\_\_

My conclusions \_\_\_\_\_

5. Account for each of the following facts :

- a. The ground under bushy shrubs is bare of vegetation.  
\_\_\_\_\_  
\_\_\_\_\_
- b. Although carbon dioxide is continuously being produced during breathing and burning, yet the proportion of this gas in the air remains small.  
\_\_\_\_\_  
\_\_\_\_\_
- c. Although starch is made in the leaves of a green plant, yet it is often found in roots and underground stems.  
\_\_\_\_\_  
\_\_\_\_\_
- d. A potted plant growing by a window should be turned around every day.  
\_\_\_\_\_  
\_\_\_\_\_
- e. The pores of a leaf are found on its under-surface.  
\_\_\_\_\_  
\_\_\_\_\_

# The Fungi

## 1. Name :

- a. Three kinds of fungi that ruin grain and food crops.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_

- b. Two skin diseases caused by fungi.

i. \_\_\_\_\_ ii. \_\_\_\_\_

- c. A fungus that is used to make bread rise.

\_\_\_\_\_

- d. A substance obtained from a mould that is widely used in medicine.

\_\_\_\_\_

- e. Three materials on which you have seen mould growing.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_

## 2. Differentiate between each of the following pairs.

- a. A host and a parasite.

\_\_\_\_\_

\_\_\_\_\_

- b. A young mushroom and a puff-ball.

\_\_\_\_\_

\_\_\_\_\_

- c. The part of a bracket fungus that grows outside a tree, and the part that grows inside the tree.

\_\_\_\_\_

\_\_\_\_\_

3. Different kinds of fungi, especially the moulds and mildews, do much damage in the garden. Search for a plant that is being damaged by a mould.

- a. Draw the mould on its victim in the given space.

- b. Answer the following questions.

On what plant was it found?

What was its colour?

How was the plant affected by it?

Did it have spore cases?



4. State:

a. Three features common to all members of the fungi family.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_
- iii. \_\_\_\_\_

b. Three favourable conditions for the growth of fungi.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_
- iii. \_\_\_\_\_

c. Three ways in which fungi can be useful.

- i. \_\_\_\_\_
- ii. \_\_\_\_\_
- iii. \_\_\_\_\_

5. a. How does bread become infected by moulds?

\_\_\_\_\_

\_\_\_\_\_

b. What would you do to make sure that mould does not form on a piece of stale bread.

\_\_\_\_\_

\_\_\_\_\_

6. Non-green plants are all dependent on green plants for their existence. Explain.

\_\_\_\_\_

\_\_\_\_\_

7. Draw the spore-producing part of the following in the space allotted to it as indicated by the letter at its side.

A. Mould.

B. Puff-ball.

C. Bracket fungus.

D. Mushroom.

|          |          |
|----------|----------|
| <b>A</b> | <b>B</b> |
| <b>C</b> | <b>D</b> |

## 10

## Plant Thieves and Cannibals

1. Group I is a list of plant thieves and cannibals. Group II is a list of parts and descriptive terms of these plants. Select one or more letters from Group II which correspond to a particular plant, and write it, or them, in the blank space at the right of the plant.

*Group I*

Bladderwort \_\_\_\_\_  
Broomrape \_\_\_\_\_  
Dodder \_\_\_\_\_  
Loranthus \_\_\_\_\_  
Mistletoe \_\_\_\_\_  
Pitcher-plant \_\_\_\_\_  
Sundew \_\_\_\_\_

*Group II*

a. Bladders. b. Club-shaped stem. c. Golden threads. d. Green flowers. e. Hair-like leaves.  
f. Lid. g. Marsh plant. h. Partial parasite. i. Pink flowers. j. Purple flowers. k. Red leaves.  
l. Root parasite. m. Scale leaves. n. Sinkers. o. Spoon-shaped leaves. p. Stem parasite.  
q. Sticky seeds. r. Straggling stems. s. Tentacles. t. White berries. u. White waxy flowers.  
v. Water-plant. w. Yellow flowers.

2. a. Why does the Broomrape steal its food?

\_\_\_\_\_

- b. How could we tell by looking at it that the Broomrape is a parasite?

\_\_\_\_\_

- c. How would you convince a farmer that the Broomrape is a parasite?

\_\_\_\_\_

3. What structures are possessed by the Pitcher-plant to :

a. Entice its prey? \_\_\_\_\_  
b. Trap its prey? \_\_\_\_\_  
c. Digest its prey? \_\_\_\_\_

4. Name :

a. Four victims of the Broomrape.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_ iv. \_\_\_\_\_

b. Three victims of the Mistletoe.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_

c. One victim of Loranthus.

5. In what way is a parasitic plant :

a. Like a fungus?

b. Unlike a fungus?

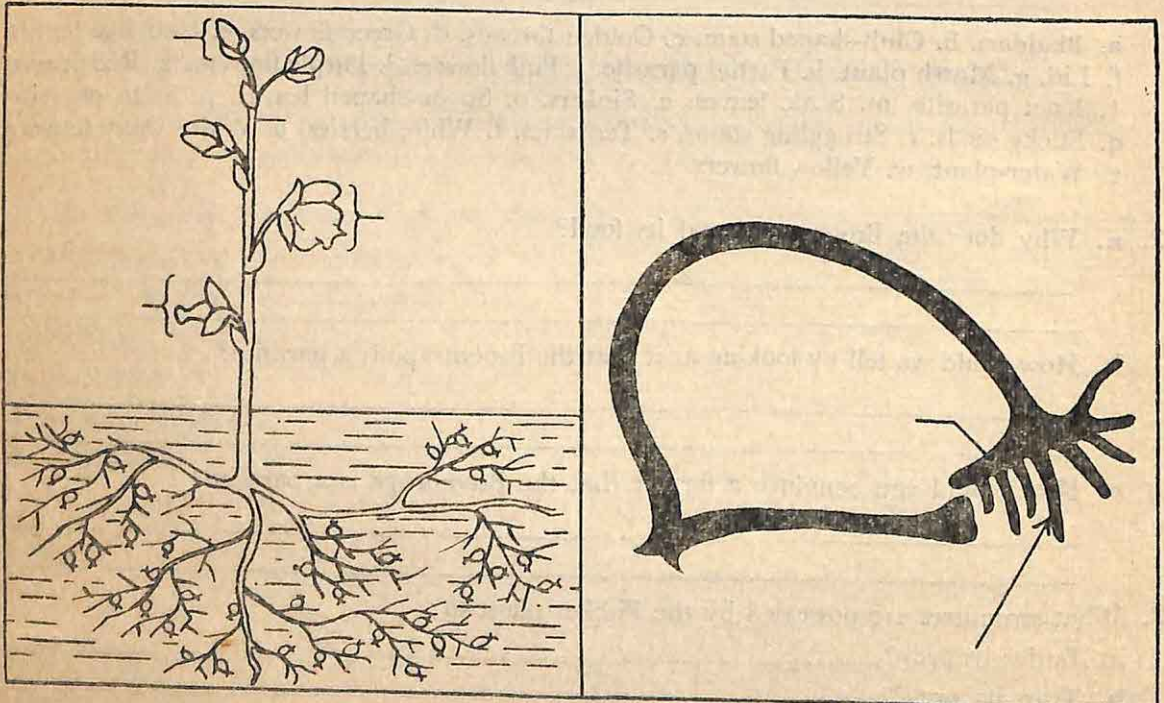
6. a. Identify each of the diagrams drawn below.

b. Label the parts indicated by guide lines.

c. Colour the diagram on the left.

d. State the function of the part to which the arrow points.

e. Encircle a single leaf on the left-hand diagram.



## Familiar Wild Flowers

1. Select the number of the item that best completes the statement and write it in the blank space at the left of the statement.

- \_\_\_\_\_ a. The Spreading Hog-weed protects itself by (i) thorns and spines ; (ii) keeping its food stored underground ; (iii) climbing up supports ; (iv) sticky fruit.
- \_\_\_\_\_ b. The leaflets of the Yellow Wood Sorrel overlap each other during the night (i) because the plant is asleep ; (ii) to prevent excessive transpiration ; (iii) to save itself from grazing-cattle ; (iv) because it has ceased to manufacture food.
- \_\_\_\_\_ c. An example of a plant bearing compound leaves is (i) Hoary Basil ; (ii) Wild Sage ; (iii) Negro Coffee ; (iv) Coat Buttons.
- \_\_\_\_\_ d. The Star Burr reproduces itself by (i) cross-pollination ; (ii) self-pollination ; (iii) cross-pollination and self-pollination ; (iv) neither cross-pollination nor self-pollination.
- \_\_\_\_\_ e. The seeds of the Gigantic Swallow-wort are dispersed by (i) wind ; (ii) water ; (iii) animals ; (iv) a sudden explosion.

.2 State :

a. Two reasons why overcrowding is harmful to plants.

i. \_\_\_\_\_

ii. \_\_\_\_\_

b. Two functions of the spines on the fruit of the Star Burr.

i. \_\_\_\_\_

ii. \_\_\_\_\_

c. Two ways by which the Yellow Wood Sorrel reproduces itself.

i. \_\_\_\_\_

ii. \_\_\_\_\_

3. a. What is meant by pollination ?

\_\_\_\_\_

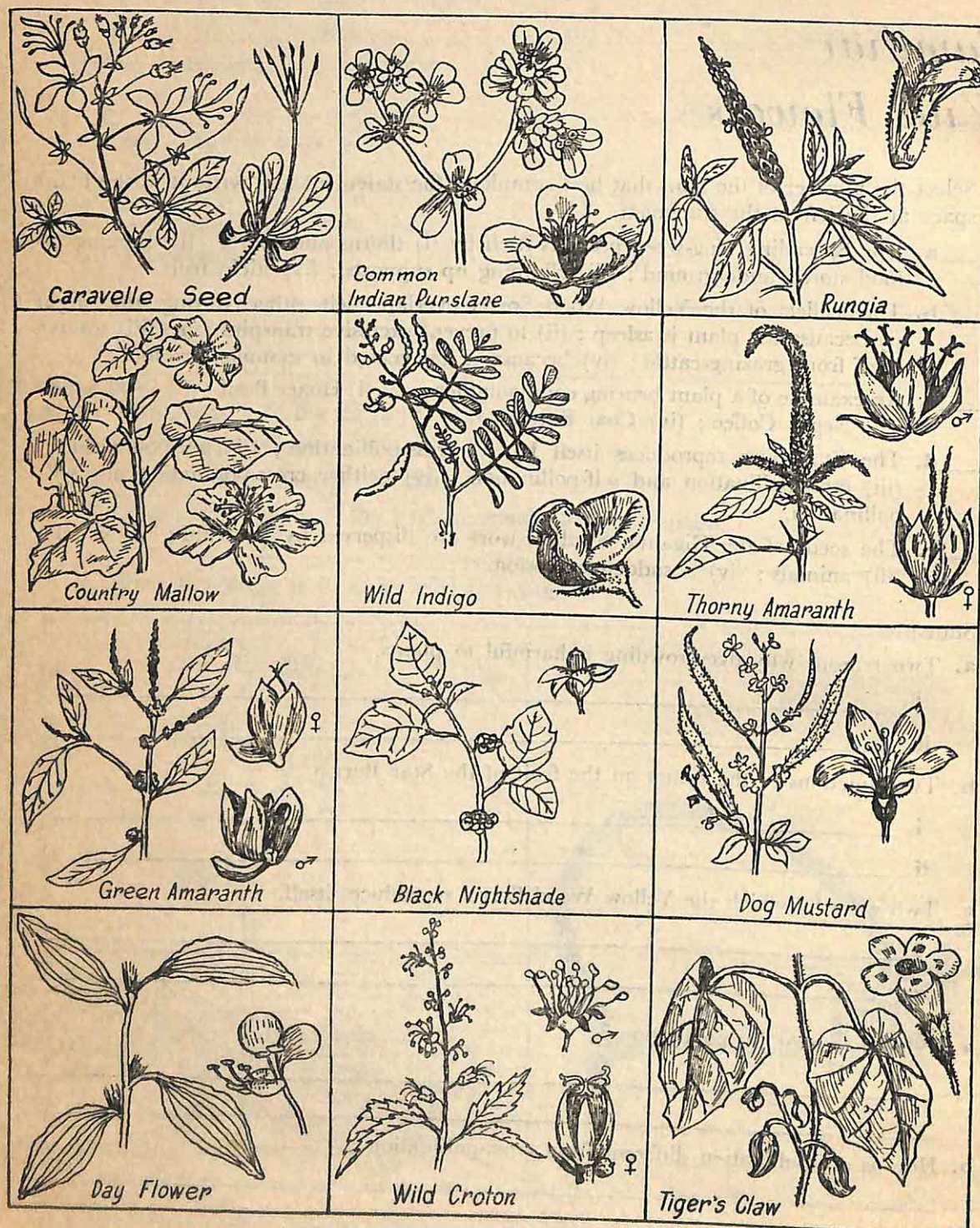
\_\_\_\_\_

b. How is self-pollination different from cross-pollination ?

\_\_\_\_\_

\_\_\_\_\_

2. Look for the following wild flowering plants. When you find one of them, colour its drawing.



♂ Male Flower    ♀ Female Flower

3. a. Write about three wild flowering plants which you have collected and studied, by answering the following questions about each, and writing the answers in the table.
- i. What is its habitat: a field; a hedgerow; a woodland; a marsh; waste ground; seashore; a wall; a bank of a stream; a bank of a pond; or a hill?
  - ii. Is it growing alone or in a community?
  - iii. Is it a common or a rare type?
  - iv. Does it have a tap-root or a fibrous root system?
  - v. Is the stem erect, prostrate, diffuse, creeping, or climbing?
  - vi. Is the stem four-angled or round?
  - vii. Is the stem hairy, prickly or smooth?
  - viii. Does it have simple or compound leaves?
  - ix. How are the leaves arranged: opposite, alternate or whorled?
  - x. Do the leaves have netted or parallel venation?
  - xi. Does the leaf have a smooth, rough, hairy, or prickly surface?
  - xii. If the leaf is simple, describe:  
its shape—long, round, oval, egg-shaped, oblong, kidney-shaped, or arrow-head shaped;  
its margin—entire, wavy, saw-toothed, crenate, or spinous;  
its apex—acute, obtuse, short-pointed, depressed, spinous, or long drawn out.
  - xiii. Are the flowers solitary or borne in clusters?
  - xiv. Does the flower have a stalk?
  - xv. Are both the stamens and the pistil found in the flower, or are they borne separately?
  - xvi. How many sepals are there in the flower?
  - xvii. Are the sepals united to form a cup or are they separate?
  - xviii. How many petals are there in the flower?
  - xix. Are the petals united to form a cup or are they separate?
  - xx. What shape is the corolla—cross-like; rose-like; bell-shaped; tubular; funnel-shaped; wheel-shaped; butterfly-like; strap-like; or two-lipped?
  - xxi. How many stamens are there?
  - xxii. Are the stamens stuck together, free, or joined to the petals?
  - xxiii. Name the pollinating agent—bee; butterfly; bumble-bee; moth; or wind.
  - xxiv. What sort of fruit does the plant bear—splitting fruit, dry fruit or fleshy fruit?
  - xxv. Name the agent which disperses the fruit—wind, water or animals.
  - xxvi. Are the seeds dispersed by an explosion?
  - xxvii. Is the plant an annual, a biennial or a perennial?
  - xxviii. During what months have you observed the plant flowering?
3. b. Draw each specimen, colour and name it.

| Question number | 1st Specimen | 2nd Specimen | 3rd Specimen |
|-----------------|--------------|--------------|--------------|
| 3. a. i.        |              |              |              |
| ii.             |              |              |              |
| iii.            |              |              |              |
| iv.             |              |              |              |
| v.              |              |              |              |
| vi.             |              |              |              |
| vii.            |              |              |              |
| viii.           |              |              |              |
| ix.             |              |              |              |
| x.              |              |              |              |
| xi.             |              |              |              |
| xii.            |              |              |              |
| xiii.           |              |              |              |
| xiv.            |              |              |              |
| xv.             |              |              |              |
| xvi.            |              |              |              |
| xvii.           |              |              |              |
| xviii.          |              |              |              |
| xix.            |              |              |              |
| xx.             |              |              |              |
| xxi.            |              |              |              |
| xxii.           |              |              |              |
| xxiii.          |              |              |              |
| xxiv.           |              |              |              |
| xxv.            |              |              |              |
| xxvi.           |              |              |              |
| xxvii.          |              |              |              |
| xxviii.         |              |              |              |
| 3. b.           |              |              |              |

12

# Raiders of the Night

1. a. What does the diagram show ?

\_\_\_\_\_

\_\_\_\_\_

- b. Name the mosquito, a part of whose life-history is shown here.

\_\_\_\_\_

- c. What clue helped you to answer 1. b. ?

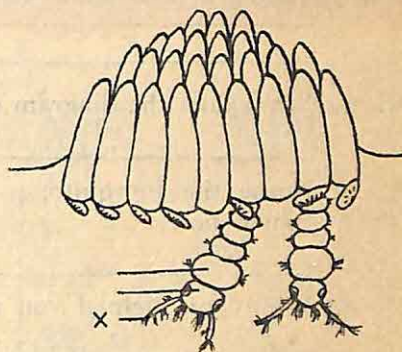
\_\_\_\_\_

\_\_\_\_\_

- d. Label the parts indicated by guide lines.

- e. What is the function of the part marked X ?

\_\_\_\_\_



2. If a statement is true write the word 'True' in the blank space below the statement ; if false, write the word(s) which should be substituted for the italicised word(s) to make the statement true.

- a. The Culex mosquito carries *malaria*.

\_\_\_\_\_

- b. The male mosquito feeds on *human blood*.

\_\_\_\_\_

- c. The pupa of a mosquito corresponds with the *caterpillar* of a butterfly.

\_\_\_\_\_

- d. A female mosquito lives for about a *month*.

\_\_\_\_\_

- e. A larva changes into a pupa within a few *hours*.

\_\_\_\_\_

3. How does a mosquito larva :

- a. Eat ?

\_\_\_\_\_

- b. Swim ?

\_\_\_\_\_

c. Breathe ?

---

---

d. Grow ?

---

---

e. Rest ?

---

---

4. a. What does the diagram show ?

---

b. Name the mosquito, a part of whose life-history is shown here.

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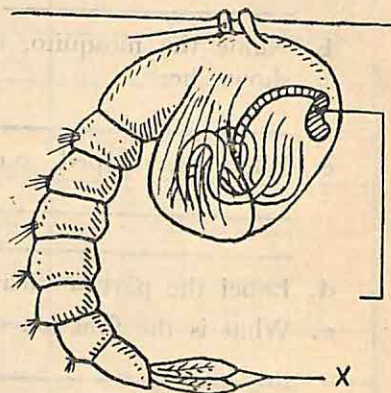
c. What clue helped you to answer 4. b. ?

---

d. Label the diagram.

e. What is the function of the part marked X ?

---



5. Solve these problems.

a. Two new boys who have had malaria are admitted to a boarding school. The district in which the school is situated is free of *Anopheles* mosquitoes. Can the new boys pass on malaria to the other children ? Explain your answer.

---

---

b. A boy who was entrusted with the school aquarium, forgot to change the water regularly. At the end of a month it was discovered that all the fish in the aquarium had died, but certain creatures, such as mosquito larvae and pupae, had remained alive. Can you explain why the fish died and yet the mosquito larvae and pupae survived ?

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c. How has a knowledge of the life-history of a mosquito helped us to discover two ways of killing this pest ?

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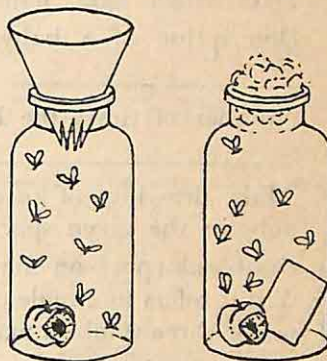
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# Two Household Pests

1. Study the life-history of a fruit-fly. Obtain a wide-mouthed bottle and a piece of ripe fruit. Prepare a paper funnel and cut one end as shown. Fit the funnel into the mouth of the bottle and leave it in an open space frequented by fruit-flies. When about half a dozen flies have entered, remove the funnel, put a small piece of white cardboard in the bottle, and plug the mouth of the bottle with cotton wool so as to imprison the flies.



- a. Fill in the following with your observations.

Date when eggs were first seen \_\_\_\_\_

Description of an egg \_\_\_\_\_

Date when larvae were first seen \_\_\_\_\_

Description of a larva \_\_\_\_\_

Date when pupae were first seen \_\_\_\_\_

Description of a pupa \_\_\_\_\_

Date when pupae changed to adult flies \_\_\_\_\_

- b. Make drawings of an egg, a larva and a pupa, in the given spaces.

|               |                |               |
|---------------|----------------|---------------|
|               |                |               |
| <i>An egg</i> | <i>A larva</i> | <i>A pupa</i> |

2. Study the life-history of a cockroach. Use the same apparatus as that used in Question 1. Use a piece of bread soaked in water as bait. Attach the funnel to the bottle with a rubber band, and place it on its side. When you have captured a cockroach with an egg-case protruding from its belly, you can begin your study.

a. Fill in the following with your observations.

Date when an egg-case was first seen \_\_\_\_\_

Description of an egg-case \_\_\_\_\_

Date when eggs hatched \_\_\_\_\_

Description of a baby cockroach \_\_\_\_\_

Number of times the baby cockroach shed its skin \_\_\_\_\_

b. Make drawings of an egg-case, and a baby cockroach, in the given spaces.

|                       |
|-----------------------|
|                       |
| <i>Egg Case</i>       |
|                       |
| <i>Baby Cockroach</i> |

3. In the blank space on the left of each of the following, write **X** if a sentence refers to a fly, **Y** if it refers to a male cockroach, or **Z** if it refers to a female cockroach. Combinations of two or three symbols may be used if a sentence refers to two or three of these creatures.

- |                                                       |                                   |
|-------------------------------------------------------|-----------------------------------|
| _____ a. Its life history is composed of four stages. | _____ b. It has a pair of jaws.   |
| _____ c. It is brown in colour.                       | _____ d. It has a pair of wings.  |
| _____ e. Its body is composed of three parts.         | _____ f. It has a neck.           |
| _____ g. It has six legs.                             | _____ h. It has a tongue.         |
| _____ i. It has a pair of wing covers.                | _____ j. It is black in colour.   |
| _____ k. It has a pair of long feelers.               | _____ l. It has pads on its feet. |
| _____ m. It has two pairs of wings.                   | _____ n. It carries a purse.      |

4. Answer the following questions.

a. Why is the housefly considered to be the nation's greatest pest ?

\_\_\_\_\_

b. In what way does the fly or cockroach help us ?

\_\_\_\_\_

c. How does the housefly spread disease ?

\_\_\_\_\_

d. How is the shape of the cockroach suited to its way of living ?

\_\_\_\_\_

e. Why is it difficult to swat a fly ?

\_\_\_\_\_

14

# Spinners, Hunters and Trappers

1. Below is a list of a few of the general characteristics of an insect. Write, on the line below each characteristic, the corresponding characteristic of the spider which proves that it is not an insect.

**a.** The body of an insect has three divisions—head, chest and belly.

**b.** An insect has three pairs of jointed legs.

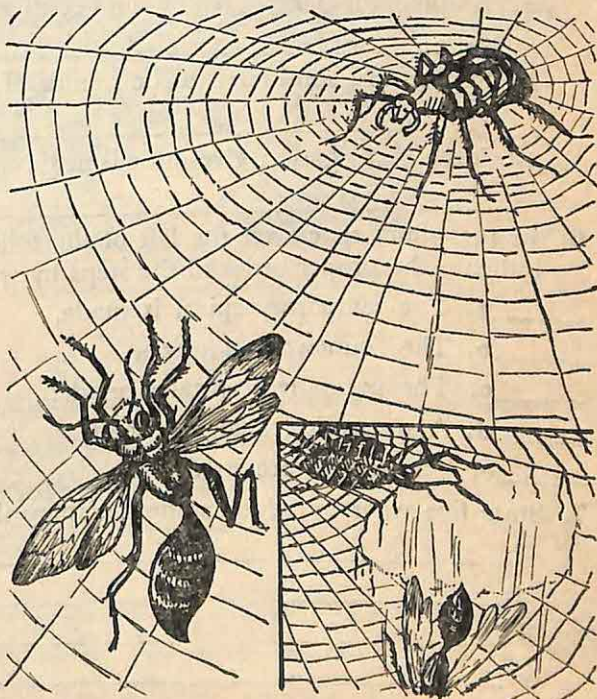
c. An insect has a pair of jointed feelers.

**d.** The legs of an insect are attached to its chest.

e. Some insects have wings.

2. Give the picture a caption. Write a story of what you see happening in the picture at the side of it. Use any of the words given in brackets if they help you.

(wasp, dangerous enemy, entangled, cuts, frees)



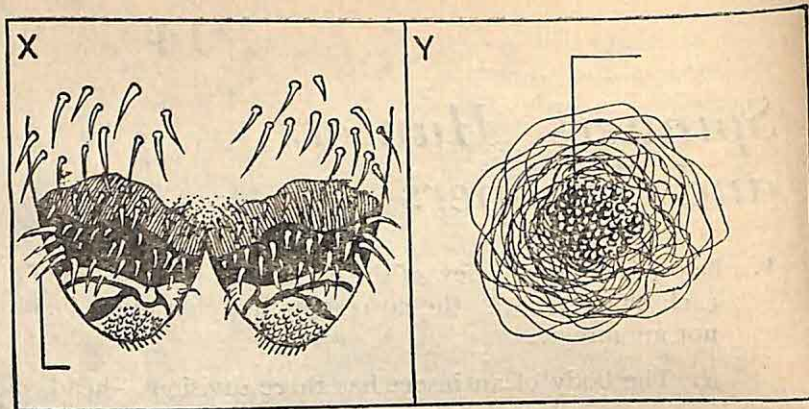
3. a. Identify each diagram.  
b. Label each diagram.  
c. Where are you likely to see:

i. The structure shown in X?

\_\_\_\_\_

ii. The structure shown in Y?

\_\_\_\_\_



4. Name:

a. Three enemies of the spider.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_

b. A spider that lives underground in tunnels.

c. A spider that feeds on mosquitoes.

5. Account for each of the following facts.

a. A spider does not become entangled in its own web.

b. Spiders are considered to be friends of man.

c. Some baby spiders give out silken threads.

6. In the blank spaces on the left of the following phrases write the numbers from 1-5 to indicate the proper order of the steps by which a spider builds its web.

\_\_\_\_\_ a. The temporary spiral is made.

\_\_\_\_\_ b. The framework is made.

\_\_\_\_\_ c. The permanent spiral is made.

\_\_\_\_\_ d. A suspension bridge is made.

\_\_\_\_\_ e. The spokes are made.

7. State five ways by which spiders employ their silken threads.

i. \_\_\_\_\_

ii. \_\_\_\_\_

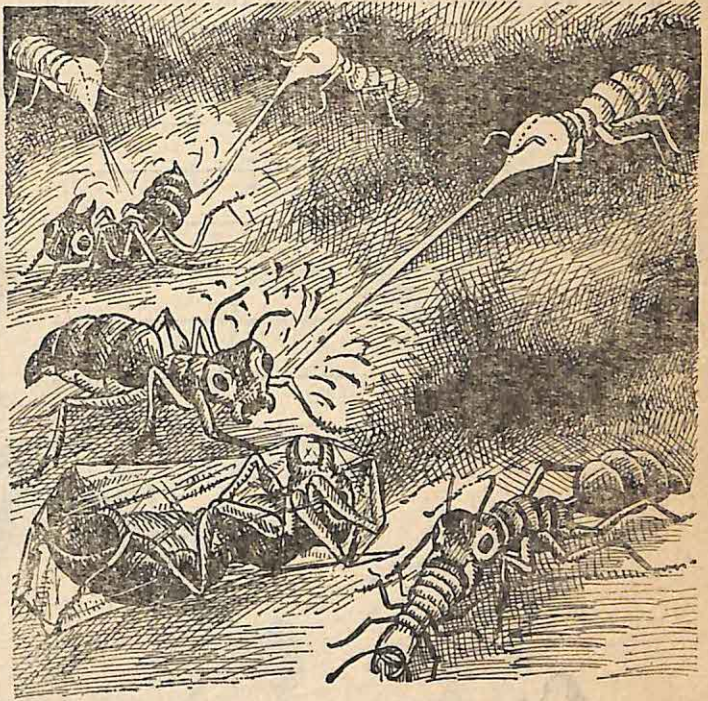
iii. \_\_\_\_\_

iv. \_\_\_\_\_

v. \_\_\_\_\_

## A Little Kingdom

1. Give the picture a caption, and write a story of what you see happening in the picture, at the side of it.



2. State :

- a. Two differences between a soldier termite and a worker termite.

i. \_\_\_\_\_

ii. \_\_\_\_\_

- b. One difference between a worker termite and a prince termite.

- c. Ten duties of a worker termite.

i. \_\_\_\_\_

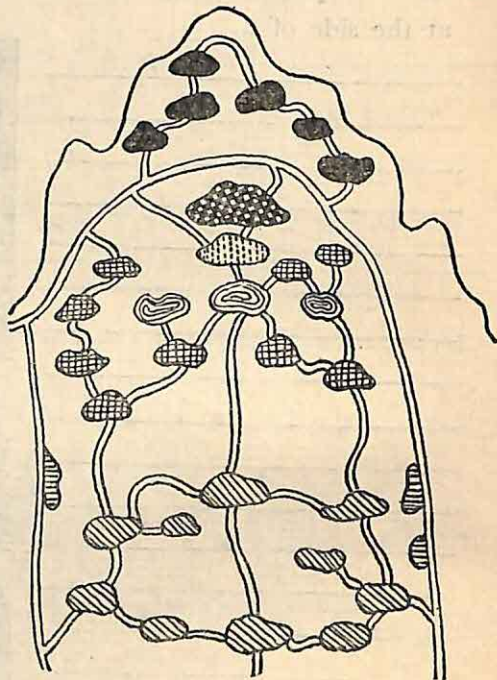
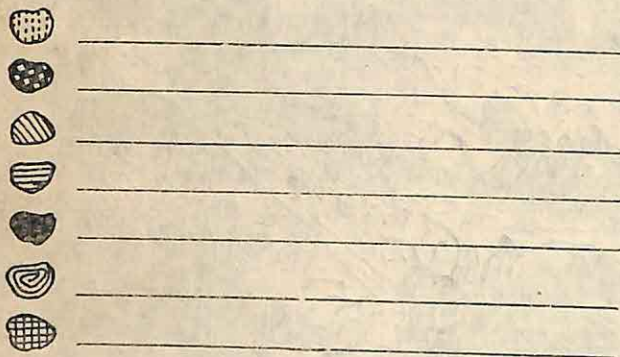
ii. \_\_\_\_\_

iii. \_\_\_\_\_

iv. \_\_\_\_\_

- v. \_\_\_\_\_
- vi. \_\_\_\_\_
- vii. \_\_\_\_\_
- viii. \_\_\_\_\_
- ix. \_\_\_\_\_
- x. \_\_\_\_\_

3. Study the sectional diagram of an ant-hill. Fill in the key below by writing at the side of each symbol the kind of room it represents.



4. Even termites have their troubles !  
Give the picture a caption and  
write a story of what you see  
happening.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

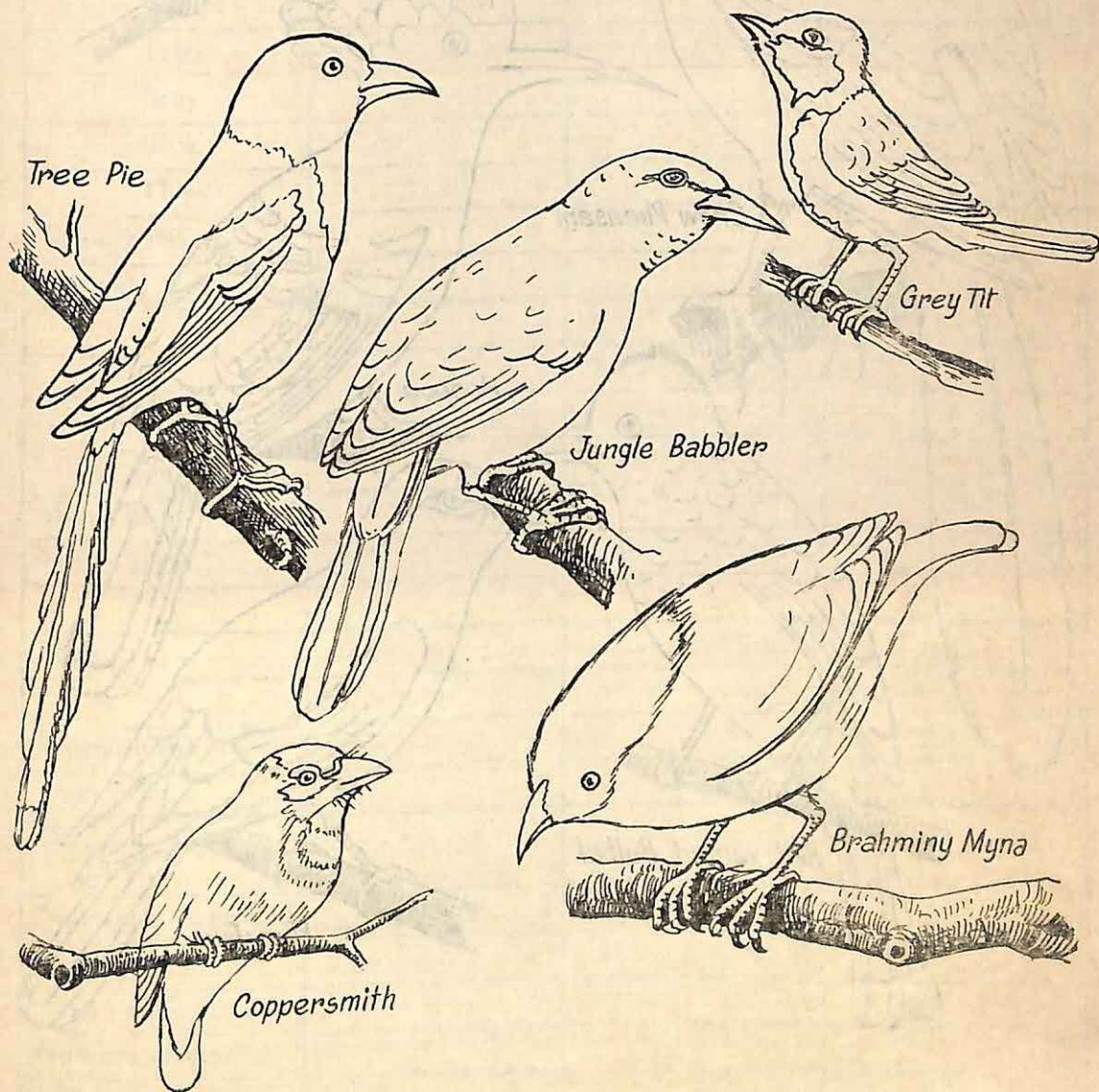
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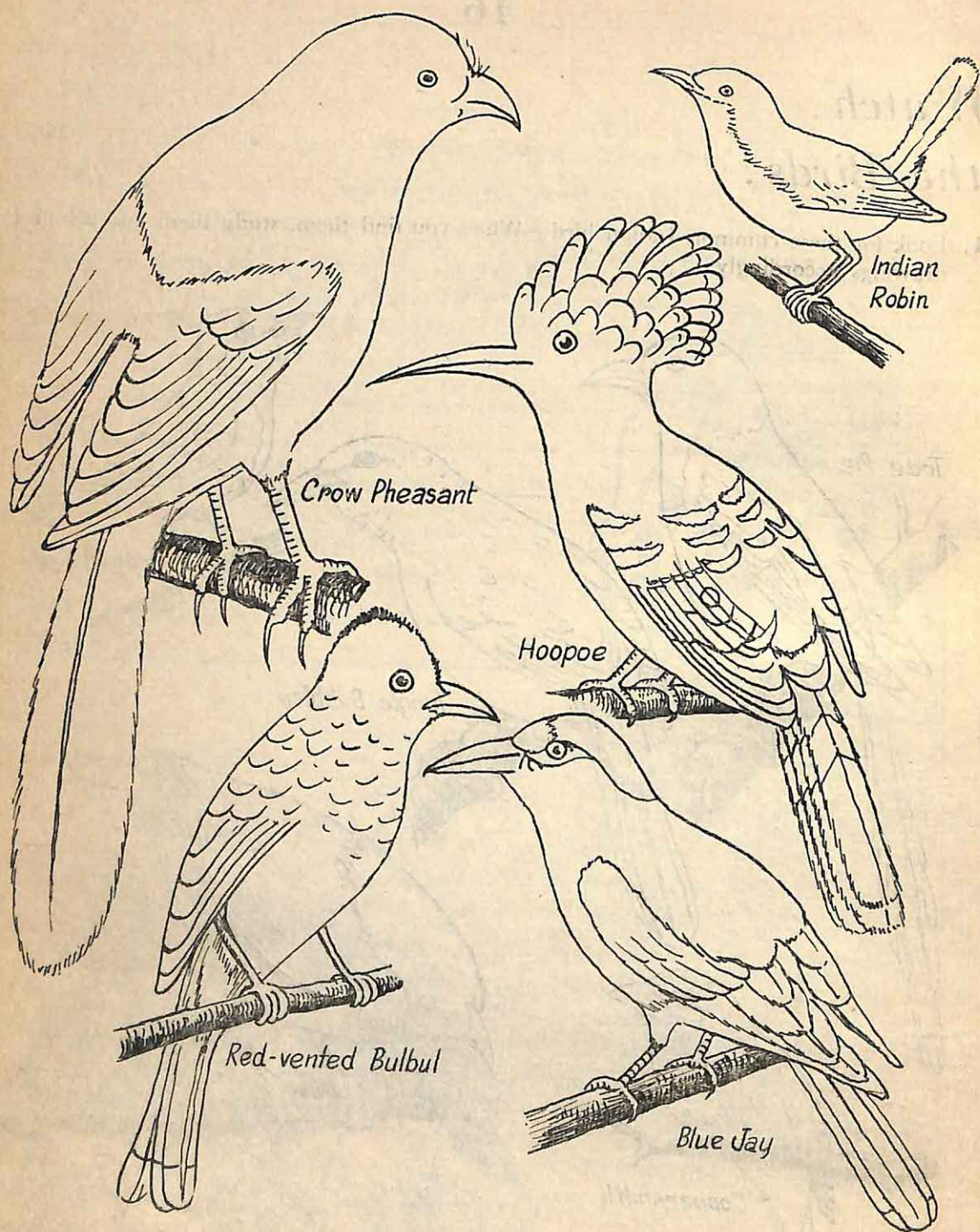
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## 16

# Watch the Birds!

1. Look for these common Indian birds. When you find them, study them and colour the drawings accordingly.





NAME

CLASS

DATE

2. Make a study of three birds. Fill in the following table with facts relating to them.

|                    |  |  |  |
|--------------------|--|--|--|
| English name       |  |  |  |
| Local name         |  |  |  |
| Size               |  |  |  |
| Colour :           |  |  |  |
| Crown              |  |  |  |
| Breast             |  |  |  |
| Wing               |  |  |  |
| Tail               |  |  |  |
| Belly              |  |  |  |
| Back               |  |  |  |
| Throat             |  |  |  |
| Colouration of     |  |  |  |
| female bird        |  |  |  |
|                    |  |  |  |
|                    |  |  |  |
| The number seen    |  |  |  |
| at a time          |  |  |  |
| When seen          |  |  |  |
| Where seen         |  |  |  |
|                    |  |  |  |
| Song               |  |  |  |
|                    |  |  |  |
| When heard         |  |  |  |
| Food eaten         |  |  |  |
| Diagram of flight  |  |  |  |
| pattern            |  |  |  |
| Movement on ground |  |  |  |
| Nesting time       |  |  |  |
| Kind of nest       |  |  |  |
| Number of eggs     |  |  |  |
| Colour of eggs     |  |  |  |
| Special features   |  |  |  |
|                    |  |  |  |
|                    |  |  |  |

3. Answer the following questions.

a. Why do most insect-eating birds nest in the summer ?

\_\_\_\_\_

b. Why does the Barn Owl screech from time to time ?

\_\_\_\_\_

c. How are the feet of a Woodpecker adapted for climbing ?

\_\_\_\_\_

d. Why does the Purple Sunbird have a long, curved beak ?

\_\_\_\_\_

e. Why does the Dove nest in thorny bushes at times ?

\_\_\_\_\_

4. Name :

a A bird with a white face.

\_\_\_\_\_

b. Two bird-enemies of the Drongo.

i. \_\_\_\_\_ ii. \_\_\_\_\_

c. Three haunts of the Waterhen.

i. \_\_\_\_\_ ii. \_\_\_\_\_ iii. \_\_\_\_\_

d. Twelve common birds in your neighbourhood.

i. \_\_\_\_\_ ii. \_\_\_\_\_

iii. \_\_\_\_\_ iv. \_\_\_\_\_

v. \_\_\_\_\_ vi. \_\_\_\_\_

vii. \_\_\_\_\_ viii. \_\_\_\_\_

ix. \_\_\_\_\_ x. \_\_\_\_\_

xi. \_\_\_\_\_ xii. \_\_\_\_\_

e. The most common bird in your neighbourhood.

f. The largest bird in your neighbourhood.

g. The smallest bird in your neighbourhood.

h. The shyest bird in your neighbourhood.

i. The most beautiful bird in your neighbourhood.

j. The bird which is the greatest pest in your neighbourhood.

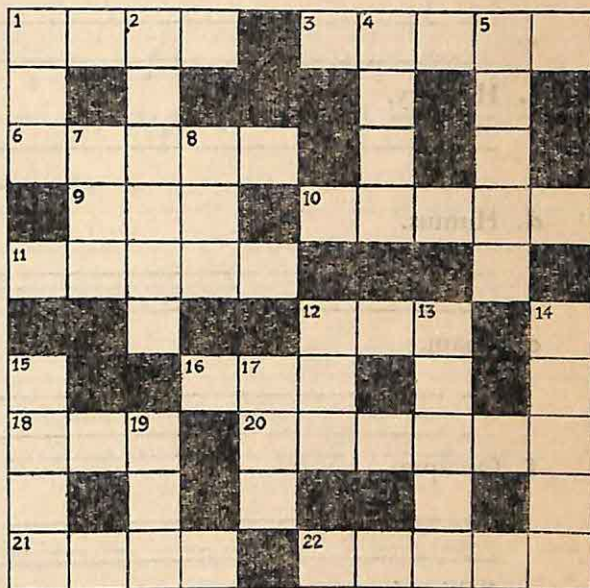
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# Test Yourself on the Year's Work

1. Do this crossword puzzle.

## Clues Across

1. Vinegar and lime juice are examples of this class of chemical substance.
3. A kind of fungi.
6. Valleys.
9. Certain trees give off this substance from their wounds.
10. An underground stem.
11. A common Indian monkey.
12. A substance spread on iron to prevent it from rusting, and also spread on the surface of a pond to kill mosquito larvae.
16. A vessel used in cooking.
18. Farmers are glad to have this bird living in their barns.
20. Starch formation is a green plant's —.
21. Mrs. Cockroach puts hers in a purse.
22. A good conductor of heat.



## Clues Down

1. Increase.
2. To light up.
4. A heavenly body.
5. A fearful bird-weapon.
7. We are able to tell the — of a bracket fungus by counting its half-rings.
8. An Australian bird that is unable to fly.
12. Sound travels roughly at the rate of — mile in five seconds.
13. The second stage in the life-history of a typical insect.
14. A fly sucks its food, whereas a cockroach — its food.
15. A common bird of the countryside which feeds on grain.
17. A beast of burden.
19. You may find bracket fungi on this in the monsoon.

2. What is meant by each of the following terms ?

a. Chlorophyll.

\_\_\_\_\_

b. Echo.

\_\_\_\_\_

c. Heronry.

\_\_\_\_\_

d. Humus.

\_\_\_\_\_

e. Loam.

\_\_\_\_\_

f. Opaque.

\_\_\_\_\_

g. Pollination.

\_\_\_\_\_

h. Rusting.

\_\_\_\_\_

i. Vacuum.

\_\_\_\_\_

j. Ventilation.

\_\_\_\_\_

k. Vibration.

\_\_\_\_\_

l. Welding.

\_\_\_\_\_

3. Differentiate between each of the following pairs.

a. Burning and Breathing.

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b. Conduction and Convection.

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c. Reflection and Refraction.

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d. Transparent and Translucent.

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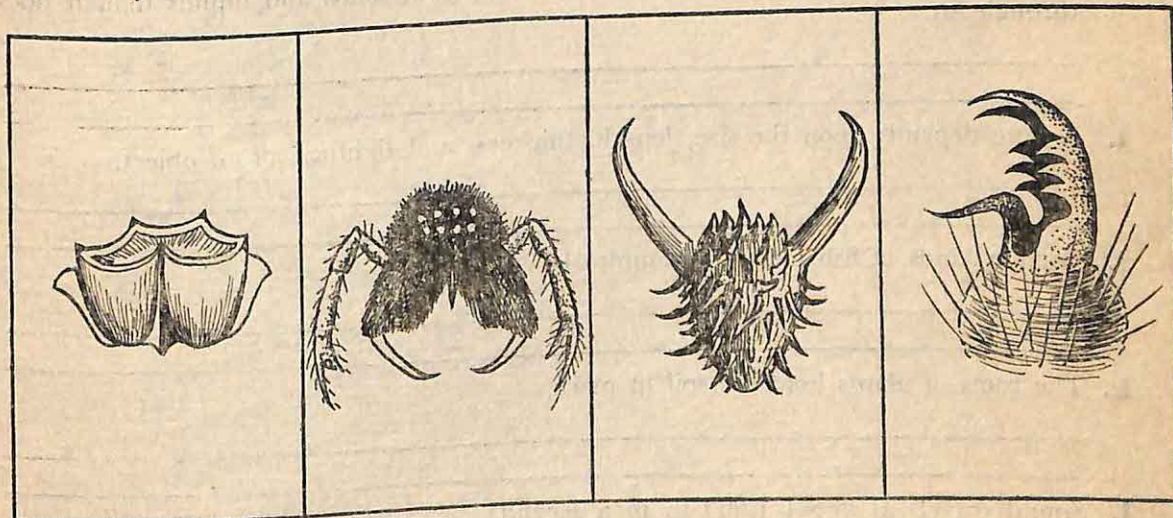
e. Larva and Pupa.

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4. Identify each of the following diagrams.




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5. State one way by which man uses each of the following facts to his advantage.

- a. Air presses in all directions.  
\_\_\_\_\_
- b. Substances burn more brightly in oxygen.  
\_\_\_\_\_
- c. Carbon dioxide does not allow substances to burn in it.  
\_\_\_\_\_
- d. Liquids expand when heated, and contract when cooled.  
\_\_\_\_\_
- e. Certain materials are good conductors of heat.  
\_\_\_\_\_
- f. Light travels in straight lines.  
\_\_\_\_\_
- g. Certain materials reflect light excellently.  
\_\_\_\_\_
- h. Sound travels more quickly and easily through most solids and liquids than it does through air.  
\_\_\_\_\_
- i. A note depends upon the size, length, thickness and tightness of an object.  
\_\_\_\_\_
- j. Certain kinds of fish feed on mosquito larvae.  
\_\_\_\_\_
- k. The roots of plants hold the soil in place.  
\_\_\_\_\_
- l. Sound travels at about 1,000 ft. in a second.  
\_\_\_\_\_



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